

# DISCONTINUITY-CAPTURING DIRECTIONAL DISSIPATION (DCDD) IN COMPUTATION OF INCOMPRESSIBLE FLOWS

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Stabilized formulations are now widely used in computation of incompressible flows., The streamline-upwind/Petrov-Galerkin (SUPG) and pressure-stabilizing/Petrov-Galerkin (PSPG) methods are among the most popular stabilized formulations. The Discontinuity-Capturing Directional Dissipation (DCDD) stabilization was first introduced in [1] as a complement to the SUPG and PSPG stabilizations for computation of incompressible flow problems with sharp gradients in the flow field. The DCDD stabilization [1,2] involves a “DCDD viscosity” and is of a form that precludes “compounding” (i.e. augmentation of the SUPG effect by the discontinuity-capturing effect when the advection and discontinuity directions coincide). The DCDD viscosity is defined based on the gradient of the solution and a length scale in the direction of that gradient. It takes into account a measure of the “jump” in the solution across an element in the discontinuity direction. Here we describe how the DCDD stabilization, in combination with the SUPG and PSPG stabilizations, can be applied to computation of incompressible flows with boundary layers. The numerical test cases we consider are flow through a bend and flow past a non-free vortex fan. The test cases are computed with a multi-level parallel program [3].

## References

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